p. 441 #5:

$f = 1.5\ Hz$ $\quad \omega = 2\pi f$

$A = 2.00\ cm$ $\quad = 3\pi\ rad/s$

a) at $t = 0\ s$, $x = 0\ m$

$\therefore$ model w/ sin function

$x(t) = (2.00\ cm)\sin[(3\pi\ rad/s)t]$

b) $v(t) = \omega A\cos(\omega t)$

$= (3\pi\ rad/s)(2.00\ cm)\cos[(3\pi\ rad/s)t]$

$= (6\pi\ cm/s)\cos[3\pi t]$

V_{max} when $\cos[3\pi t] = |1|$, and this happens when $t = \frac{1}{3}\ s$

$\cos(\pi) = 1$

$3\pi t = \pi$

$t = \frac{1}{3}$

$V_{max} = (6\pi\ cm/s)\cos[(3\pi\ rad/s)(\frac{1}{3}\ s)]$ → -1

$= -18.8\ cm/s$

c) $a(t) = -\omega^2 A\sin[(3\pi\ rad/s)t]$

a_{max} when $\sin[(3\pi)t] = 1$, and this happens when $t = \frac{1}{2}\ s$

$3\pi t = \frac{\pi}{2}$

$t = \frac{1}{2}\ s$

$a_{max} = -(3\pi\ rad/s)^2(2\ cm)\sin[(3\pi)(\frac{1}{2})]$ → 1

$= 178\ cm/s^2$

d) $x(\frac{1}{6}) = (2\ cm)\sin[(3\pi)(\frac{1}{6})]$ → 1

$= 2\ cm$

for $\frac{1}{6}\ s$, it goes $2\ cm$

in $1\ s$, $d = (2\ cm)(6) = 12\ cm$

p.442 #9:

$$f = \left(3600 \frac{\text{rev}}{\text{min}}\right)\left(\frac{1 \text{ min}}{60 \text{ s}}\right) = 60 \text{ rev/s} = 60 \text{ Hz}$$

$$\omega = 2\pi f = 2\pi (60 \text{ rev/s}) = 120\pi \text{ rad/s}$$

$$v_{max} = \omega A$$

$$= (120\pi \text{ rad/s})(.05 \text{ m})$$

$$= 18.8 \text{ m/s}$$

$$a_{max} = \omega^2 A$$

$$= (120\pi \text{ rad/s})^2 (.05 \text{ m})$$

$$= 7106 \text{ m/s}^2$$

p. 442 #15:

$$K_i + U_{si}^{0} = K_f^{0} + U_{sf}$$

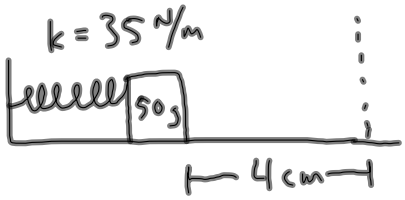
$$\frac{1}{2}mv_i^2 = \frac{1}{2}kx^2$$

$$v_i = \sqrt{\frac{kx^2}{m}}$$

$$= \sqrt{\frac{(5E6\ N/m)(.0316\ m)^2}{(1000\ kg)}}$$

$$= 2.23\ m/s$$

p. 442 # 17:



a) $E = \frac{1}{2} k A^2$

$= \frac{1}{2} (35\ N/m)(.04\ m)^2$

$= .028\ J$

b) $V = \pm \sqrt{\frac{k}{m}(A^2 - x^2)}$

$= \pm \sqrt{\frac{(35\ N/m)}{(.05\ kg)}\left[(.04\ m)^2 - (.01\ m)^2\right]}$

$= \pm 1.05\ m/s$

c) $K = \frac{1}{2} m \left[\frac{k}{m}(A^2 - x^2)\right]$ $x = 3\ cm$

$= \frac{1}{2}(35\ N/m)\left[(.04\ m)^2 - (.03\ m)^2\right]$

$= 0.123\ J$

d) $U_s = \frac{1}{2} k x^2$

$= \frac{1}{2}(35\ N/m)(.03\ m)^2$

$= 0.0158\ J$